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Journal of the Society of Arts.

FRIDAY, AUGUST 10, 1866.

Announcements by the Council.

EXAMINATIONS, 1867.

The Programme of Examinations for 1867 is now published, and may be had *gratis* on application to the Secretary of the Society of Arts.

NATIONAL MUSICAL EDUCATION.

The Council of the Society of Arts, having communicated to the Royal Academy of Music the First Report of the Musical Education Committee, already published in the *Journal*,* have received a reply from the Royal Academy, saying that "the Directors concur with the Committee in their views of the general principles on which a National Academy of Music should be established," and also "agree with the Committee in thinking that the endowment of a number of scholarships, affording the means for gratuitous instruction to young persons of superior musical talents, would be the most effectual mode of extending the usefulness of the Academy, and of placing it on a popular basis."

At a meeting of the Musical Education Committee, held on Wednesday, the 1st inst., the following minute was passed, and it has been received by the Council:—

1. It appears from the evidence that the Royal Academies of Music of Paris, Brussels, and Naples furnish instances of highly successful institutions, on an extensive scale, and present especially useful suggestions for the re-organization of the Royal Academy of Music. At Paris above six hundred out-door students, selected from all parts of France, are educated, and at Naples between two and three hundred students are trained. In both cases the education is gratuitous to the students, the expenses being paid by the state: at Brussels there are above 500 students whose expenses are defrayed partly by the state and partly by the municipalities.

2. The Committee are of opinion that a National Academy for the United Kingdom, its colonies and dependencies, should provide for the instruction of a certain number of students, supported by public funds, and a certain other number paying adequate fees. They consider that at present about two hundred students might be fixed as a proper number to receive gratuitous training, and that of this number one hundred, selected by public competition, should be supported by public funds disbursed under ministerial responsibility, the remainder if possible by colonial, municipal, or other corporate funds and by private endowments and subscriptions. Arrangements should then be made to allow about 100 private students in addition to enter and pay adequate fees for their instruction; but this number ought not to be allowed to outgrow the number of students in training without very careful consideration of the responsible managers.

* Present volume, p. 165.

3. The Committee are of opinion that as our colonies and India send many young persons to this country for general education, it might reasonably be expected that they would be induced to send persons having musical gifts for musical education if the training were as efficient as it might be.

4. So far as the Committee are enabled to judge from the evidence, they consider that the cost of properly training two hundred free students would be about fifteen thousand pounds sterling a-year, being at an average rate of seventy-five pounds a-year for each student; out of this sum grants for maintenance, at varying rates, might be allowed to the students, in accordance with the system which is found to work so successfully in the Art Training Schools at South Kensington. Some students might hold scholarships without receiving any maintenance allowance, and the Committee have reason to hope that private individuals will come forward and endow scholarships.

Proceedings of Institutions.

DROYLSDEN EDUCATIONAL INSTITUTION.—The report of the directors, read at the last annual general meeting, held February 20, 1866, congratulates the members upon the increased facilities for educational purposes which have been afforded by the Institution, and upon the great measure of prosperity which has attended their efforts during the year. In former reports the directors have had to lament the depressing influence of the state of the staple trade of the district upon the progress of the Institution; but, happily, this unexampled gloom has now passed away, and the directors look forward with confidence to the future. In last year's report the directors had the gratification of announcing a considerable accession to the number of members; this year, however, they are happy to state that the increase has been much greater, the total number of members of all classes being 392, showing an increase of 72 since last year. In the library department considerable progress has been made, the number of readers and of books issued having largely increased during the year, the total issued being 2,759, showing an increase upon last year of 993. The average number of readers per month during the year has been 110. The total number of volumes at present in the library is 1,222, being an increase of 91 volumes during the year. The great success of the evening classes has been a remarkable feature in the working of the Institution during the year, the number of pupils in attendance showing a considerable augmentation. The re-opening of the classes for the season took place in October last, when upwards of one hundred prizes were presented to members of the elementary classes, and also valuable prizes of books and instruments to the members of the Chemistry class, awarded by the Science and Art Department, and by the gift of Robert Rumney, Esq., of Manchester. The prizes to the elementary classes were given for regular attendance and general progress during the previous season. Out of 14 members of the Chemistry class 11 passed the examination of the Science and Art Department successfully. The success of the Botany class was less favourable. Classes for the study of geometrical drawing, mechanical drawing, and building construction, have been formed, containing altogether about 61 members, and are in successful operation. The average attendance at these classes is very good. An elementary class of adult males has been formed, and is now working successfully, being superintended by two of the directors. The number of pupils attending the various classes is as follows:—Elementary classes—females, 137; do., males, 113; do., male adults, 11; Chemistry classes, 13; Drawing classes, 61; total, 335. A most important feature in the year's programme has been the course of twelve weekly lectures, which have been delivered on Monday evenings

during the winter. Among the subjects treated were:—"Town Life in New Zealand," by George Heppel, Esq., M.A., of Manchester; "Coal and some of its Products," by Robert Rumney, Esq., of Manchester; "Wonderful Things Revealed in Chemistry," by Thomas Lawton, Esq., of Manchester; "Yorkshire Wit amongst Yorkshire Roughs," by the Rev. J. V. B. Shrewsbury, of Manchester; "Personal Visits to the Battlefields of England," by the Rev. James Bardsley, M.A., of Manchester. At the annual soirée the attendance was very large and the proceedings satisfactory. The chair was taken by the president, who delivered an address to the members and their friends on the position and prospects of the Institution. Mr. Lawton, the agent of the Lancashire and Cheshire Union of Institutes, and Visiting Officer of the Society of Arts in that district, also attended and gave a most valuable address, pointing out to the young people present the advantages to be derived from their connection with Institutions of this class. During the winter a singing class was established, which had the use of the large room one evening in the week, but from the limited attendance it was not deemed advisable to retain the services of a teacher, as this would have entailed expense on the Institution. The Penny Bank has continued its successful career. The number of depositors has steadily increased, and the weekly amount deposited is now greater than in any former period, having latterly exceeded £5 per week. Notwithstanding the considerable amount withdrawn, and the increased sums transferred to the Post-office Savings Bank, the balance in hand has been steadily augmented, and now exceeds that at any previous date.

EXAMINATION PAPERS, 1866.

The following are the Examination Papers set in the various subjects at the Society's Final Examinations, held in April last:—

(Continued from page 590).

MINING AND METALLURGY.

THREE HOURS ALLOWED.

1. Describe the English process of manufacturing wrought iron from ordinary pig-iron.
2. In what way is copper obtained from sandstone ores, containing from 1½ to 2 per cent. of that metal?
3. Describe the Frieburg method of amalgamation.
4. Where are tin ores principally found, and how are they prepared for the market?
5. How would you extract the metals, in a country in which wood and charcoal are the only available fuel, from an ore containing 30 per cent. of lead, and 40oz. of silver to the ton of mineral?
6. Describe Bessemer's process for manufacturing steel.
7. Give the respective approximative compositions of Welsh coal, anthracite, and north country steam coal.
8. What amount of power will be expended in pumping per minute 800 gallons of water from a depth of 520 feet?
9. Describe the ordinary round buddle employed for slime dressing.
10. Describe the iron ores of the Cleaveland districts, and state in what geological formation they occur.
11. How would you determine the amount of ash contained in a specimen of coal?
12. Describe the method employed for making the survey of a mine in which the presence of iron interferes with the action of the magnetic needle.

BOTANY.

THREE HOURS ALLOWED.

The candidate is expected to answer correctly three questions in Section I. and six questions in Sections II. and III., including descriptions of at least two of the fresh specimens. Nos. 8, 9, *and* 10 *each stand for an answer.*

SECTION 1.—STRUCTURE AND PHYSIOLOGY.

1. Define the following terms, and give examples in illustration as required.

Diadelphous. Give examples from two Natural Orders.
Orthotropous. Give two Natural Orders in illustration.
Circumscissile. Name fruits of genera belonging to two Natural Orders in illustration.
Accrescent. Give an example.

2. What are *Stipules?* In which British Natural Orders are they generally present? In which absent?
3. Explain the structure and function of *Leaves.*
4. What is the function of *Albumen?* Name six British Natural Orders which generally have *albuminous,* and six which have *exalbuminous* seeds.
5. Name the essential *elementary constituents* of plants.
6. What functions are liable to be interfered with in *transplanting?* And how is fatal disturbance to be guarded against?

SECTION II.—SYSTEMATIC AND ECONOMIC BOTANY.

1. State the principles upon which plants are *classed.*
2. Which natural orders furnish the following products? State the part of the plant affording each:—*Cotton, saffron, mace, colza-oil, arnatto, sugar.*
3. Distinguish *Rosaceæ* from *Leguminosæ.*
4. Distinguish the genera Oak (*Quercus*), Chestnut (*Castanea*), and Beech (*Fagus*).
5. Describe the usual structure of the flower in *Grasses.*
6. Describe the principal modifications of the *capitulum* and of the *fruit and its appendages* in British *Compositæ.*
7. Name the *Natural Order* to which the plants marked A. B. and C. respectively belong, with *reasons* for your opinion.

SECTION III.—DESCRIPTIVE BOTANY.

8, 9, and 10. Describe the three plants marked A, B, and C, in the proper sequence of their organs, and in accordance with the examples given in Lindley's "Descriptive Botany" and Oliver's "Lessons" (Appendix).

FLORICULTURE.

THREE HOURS ALLOWED.

1. What are the conditions most favourable to the germination of seeds?
2. Describe the process of budding, and point out in what respect it differs from grafting.
3. How and by what means, if at all, may hardier races of any particular kind of plant be obtained?
4. For what special cultural purposes are "span-roofed" and "lean-to" houses most suitable?
5. Suppose a conservatory has to be decorated at Christmas with flowers, some in their natural season, others forwarded or retarded by artificial treatment. Name a few of the leading plants which will naturally be in a condition to be used for that purpose, and name also some of the most important of those which would have to be prepared artificially, indicating in general terms the mode of preparation.
6. The showy Pansy of the garden is understood to have been produced from one of our wild pansies. Describe how this change can have been effected.
7. What are the conditions and processes, at the flowering stage of a plant, necessary to the production of fertile seed?
8. What system of treatment would be specially conducive to the production of abundance of blossoms, and what would be most conducive to a paucity of blossoms? Take greenhouse Azaleas and Pelargoniums as examples.
9. Name the principal decorative plants available for the garden, greenhouse, and stove, in the different months of the year, in establishments where both stove and greenhouse accommodation are provided.
10. How should forcing houses be ventilated, and for what reasons mainly is ventilation necessary in such structures—to which artificial heat, it is to be remembered, is being at the same time applied?

11. Describe the process of hybridizing plants, and the conditions necessary to a successful result—that is, the actual production of hybrids.

12. In what way is bottom-heat important in plant-culture, and how is it best applied?

(To be continued.)

THE PIAZZI MONUMENT.

The following letter, with enclosure, has been addressed to the Secretary of the Society of Arts:—

Science and Art Department, London, W.,
30th day of July, 1866.

"SIR,—I am directed by the Lords of the Committee of Council on Education to forward to you the enclosed copy of a translation of a letter received from the Executive Committee of the Commission appointed to erect a monument to Piazzi, the astronomer, as being likely to interest the members of the Society of Arts.

"I have, &c., "HENRY COLE."

[TRANSLATION.]

"SIR,—The Commission elected by the free-town of Ponte di Vatellina, Lombardy, for erecting the proposed monument to Piazzi, the astronomer, having determined to apply to the authorities, and persons of rank, in various places where the great astronomer had given proof of his estimable character and scientific attainment, has considered it right to address to you and the Professors of the Institution with which you are connected, a request for a subscription in aid of this excellent object, for it was in England especially—that country so well deserving of liberty and progress—that Piazzi, honoured by the friendship of the learned men of the day, laboured in conjunction with Jesse Ramsden, the great astronomical discoverer; and it was at the Observatory of Greenwich that he observed the solar eclipse of 1788. It was to one of the most illustrious scientific bodies of England—the Royal Society—that the great man dedicated his famous 'Catalogue of the Stars;' and on the ground of this combination, so to say, of Italian and English fame, and of the traditional generosity of the free people of England, we appeal to you, in reference to this movement of ours, respectfully requesting that you will give it your support in the scientific institutions of your celebrated city.

"We are, &c., the Executive Committee:—
"Professor B. E. MIRMERI, President.
"Professor GICCIARDI, Vice-President.
"F. PATRIZI.
"ORTENSIO PIAZZI.
"L. MARCHEDI.

Ponte di Vatellina, 30 April, 1866.

PATENTS.

It appears, from the report of the Commissioners of Patents, that in the year 1865 there were 3,386 applications for patents, and 2,186 patents in fact passed the seal; rather more than a third of the applications were not proceeded with. Of the patents actually sealed, about 70 per cent. became void at the end of the third year by non-payment of the £50 stamp duty then payable, and about 90 per cent. of the remainder became void at the end of the seventh year by non-payment of the £100 stamp duty then payable to secure the patent for a second term of seven years. The receipts of the Patent-office in the year 1865 amounted to £115,340. The fees to the Attorney-General and Solicitor-General and their clerks absorbed £10,118; compensations, £4,554; the general expenditure, £32,154. After further deducting what are regarded as "revenue stamp duties" there remained £47,324 surplus income for the year. It is not considered that the fees are too heavy; a material reduction would tend to increase the number of useless and speculative patents, often taken merely for advertising purposes. But the offices and the establishment having become quite inadequate for the work to be done, it is represented that the surplus income of the department, now applied in increasing the public revenue, should be appropriated to the erection of suitable patent offices, library, and museum, the latter to serve as a historical and educational institution for the benefit and instruction of skilled workmen; and the Commissioners of Patents annex to their report this year a plan for the appropriation to this purpose of Fife-house and gardens in Whitehall, abutting on the Thames Embankment.

The reports made by Messrs. Greenwood and Hindmarch last year propose also that the offices of Clerk of the Patents and Clerk of the Commissioners be abolished, and that the Chief Clerk should be a person of skill, who could at once give to the law officer the information necessary to enable him to determine whether a provisional specification sufficiently describes the nature of the invention, and whether it is one for which a patent ought to be granted—a course by which many grants of patents for frivolous inventions would be prevented, and more definite information would be obtained respecting the nature of inventions sought to be patented. The Commissioners report that the preparation and publication of classified abstracts or abridgments of the specifications from the earliest period to the present time continues; and copies of these (each set of the Patent-office publications including upwards of 2,000 volumes) have been presented to the authorities of every important town in the kingdom on condition of their being daily accessible to the public free of charge. It is estimated that above 80,000 more abridgments have to be made to complete the work to the present time. Messrs. Greenwood and Hindmarch suggest that in future the specifications should be abridged as they come into the office. An alphabetical index to French patents has been made in the English language, and a general index to the scientific periodicals in the library, and it is suggested that these, if printed, would be found of great value to the public.

EXTRACTING THE PRECIOUS METALS BY MEANS OF SODIUM AMALGAM.

The extraction of gold by amalgamation has been attended hitherto with serious difficulties, owing to the presence in the ore of sulphurets, arsenic, antimony, bismuth, or tellurium compounds, which coat the gold with a film of tarnish, so that the mercury cannot touch it. Again, with many minerals the mercury is "sickened," its fluidity is destroyed, and it becomes either a tenacious mass, or it assumes a powdery character. In each case, its amalgamating action is almost destroyed. The result is, that from 30 to 80 per cent., or more, of the gold escapes the action of the mercury, being lost in the "tailings," whilst large quantities of the mercury are also carried off in the washings.

The following figures, extracted from official documents, show the percentage of gold constantly being lost at some of the most important gold mines in different parts of the world:—

At the St. John del Rey mine the loss of gold is.....	30	per cent.
In the Brazils generally....	30 to 35	,,
In Piedmont.....	35	,,
At Zell	35 to 40	,,
In Hungary and the Tyrol..	50	,,
In Chili.....	66	,,

In many cases the waste of mercury is even more serious than that of gold.

The new process discovered by Mr. William Crookes, F.R.S., is stated to possess the following advantages:—By the judicious admixture of a certain proportion of sodium, &c., with the mercury, its amalgamating powers, under all circumstances, are preserved and intensified. It will extract gold from sulphurets and other minerals which have hitherto resisted the ordinary process; it

will seize upon gold so tarnished that it would otherwise pass untouched through common mercury, and be lost in the tailings; it will prevent absolutely the "sickening" and "flouring" of the mercury, conditions which mar the extraction of the gold; and, finally, the yield of gold is greatly augmented, and a considerable saving in mercury is effected.

When some or all of the above-mentioned minerals are present with the gold (and specially if the latter occurs with pyrites), the mercury in which the ore is triturated or ground, becomes "floured," "granulated," or powdered, *i.e.*, it becomes subdivided into excessively minute globules, which, owing to the film of tarnish they have contracted, refuse to reunite, and are consequently washed away, it being almost impossible to effect their separation from the heavier portions of ore by any known process.

The presence of some of these minerals affects the mercury in another way, viz., by "sickening" it. "Sick" mercury has lost its fluidity, and will not flow with a bright surface, neither will it touch gold except with great difficulty. The ill effects of "sickening" are not so great as those of "flouring." "Sick" mercury can generally be restored by distillation, when not much is lost: the chief objection being that it will not take up gold from the ore; but "floured" mercury is not only entirely lost, but it carries away with it all the gold which it already may have taken up.

Another very serious loss is the following:—Even when the mercury preserves its bright metallic condition, and is in the most active state ever met with in commerce, it will seldom take up more than half or two-thirds of the gold present in the ore, owing to the precious metal being naturally tarnished on its surface and resisting the action of the mercury except when they are ground together for a longer time than is usually practicable.

All these sources of loss are said to be avoided by dissolving a little sodium amalgam in the mercury before it is introduced into the amalgamating vessels The best proportion of amalgam to the mercury must be found out by experiment, as nearly every kind of ore will require a different treatment; but considerable latitude is permitted, and the addition of a little too much does not appear to do harm. It is recommended that one part by weight of amalgam be dissolved in thirty parts of the mercury which is to be used in the gold amalgamating vessels or triturating or grinding machines, and the effect which it produces on the mercury noted from time to time during the operation. If the mercury retain its fluidity and brightness to the end of the operation, it is a sign that either sufficient or too much has been added, and a second experiment should be tried with the addition of a diminished quantity of amalgam. But if it be "floured" or "sick," or any be lost, amalgam may be added, until the best proportion is arrived at.

In many gold mining works, it is found advantageous to employ amalgamated surfaces of copper, over which the crushed ore, tailings, and slimes, or such materials are allowed to flow; or to introduce amalgamated copper plates into the triturating and grinding machines. By this means some of the gold and floured mercury, which otherwise would have been lost in the tailings is collected on the copper, and may be scraped off from time to time. The adoption of this principle will be found of great use in all gold and silver amalgamating works, in which the extensive adoption of amalgamated metallic surfaces is recommended for the riffle boxes, launders, shaking and percussion tables, floors, or other parts along or over which the crushed ore, tailings, slimes, or such material flow.

By employing the amalgam in coarse powder and sprinkling it over the wetted metallic surface which it is wished to amalgamate, and then rubbing it over with a little clean mercury, a firmly adherent and brilliant coating of mercury will be given to the metal. Not only can copper be amalgamated in this way, but the same result is produced on galvanized iron (iron coated with a thin layer of zinc), or tin plate (iron coated with a thin layer of tin), on lead, and less perfectly on iron and steel. In all cases it is advisable to preserve the effective surface and the amalgamating energy of the mercury on the metal plates by an occasional sprinkling of powdered amalgam applied from time to time as required.

This process is also applicable to silver ores. The causes of loss in silver amalgamation are — 1, the "flouring" or powdering of the mercury owing to the mechanical treatment it undergoes; 2, the "sickening" of the mercury, owing to the presence in the ore of certain deleterious minerals; and, 3, the chemical change of the mercury into corrosive sublimate and calomel, which it undergoes in the act of reducing the chloride of silver to the metallic state.

The employment of the amalgam in conjunction with the mercury is intended as a remedy for each of these evils. By dissolving in the mercury some of the amalgam, in the proportion of two parts of amalgam for one part of silver present in the ore, all these evils are stated to be prevented. The chlorine goes to the other metals present, instead of to the mercury, and the decomposition takes place so rapidly, that an operation which formerly would take a week is sometimes finished in 12 hours.

The following experiments may be made to show the special action of sodium amalgam upon "floured" and "sick" mercury, and upon gold and silver ores:—

1. Take a piece of dry chloride of silver and put it in a watch glass or small dish. Cover it with water and put a globule of mercury of about its own bulk in contact with it. The two may be rubbed together for hours without any apparent change taking place, but if a piece of either of the amalgams be dropped into the mercury, the latter will seize hold at once upon the chloride of silver and in a few minutes will appear to have eaten its way through, reducing it to the metallic state, and at the same time amalgamating with the silver.

2. Take about five grains of pure mercury and put it into a small dish or a watch glass. Pour over it a few drops of solution of perchloride or persulphate of iron. This will "sicken" the mercury readily, especially if it be moved about with the finger. When thoroughly "sick," drop into it a piece of amalgam, about one-hundredth part the size of the mercury. Instantly, as if by magic, the "sick" mercury recovers, and assumes its globular form.

3. Sicken another globule of mercury in the same manner. Pour on to it the recovered mercury from the former experiment (No. 2), and it will be seen to cure the second portion also.

4. Thoroughly flour or powder a dozen grains of mercury by violently shaking them in a bottle with weak gum-water and a few drops of perchloride of iron. Pour off the liquid and wash once or twice. Now transfer the powdered mercury to a dish, and put into it a few gains of amalgam, and gently rub them together under water. In a few minutes the whole of the mercury will be reduced to the bright metallic state. Mercury floured and sickened with grease will be brought back to the active state with the same readiness.

5. Take two portions of pure mercury (about 100 grains each). Pour water over them, aud put ten grains of amalgam into one of them. Now take a piece of gold ore, containing visible gold in it, and dip it into the common mercury. Scarcely any, or no, action will take place. Then dip the same piece into the amalgamated mercury, and the latter will instantly unite with the gold and whiten it. A gold coin dipped into common mercury will seldom be acted upon except in a few spots, but when dipped into the amalgamated mercury it is instantly wetted by the metal over its whole surface. The same experiment may be performed with a silver coin and a piece of gilt paper.

5. Take some iron pyrites and mix with it any of the ores which are most antagonistic to amalgamation by the ordinary process, such as arsenic or tellurium ore (if these cannot be got they may be left out). Grind up

100 grains of this mixture with 5 grains of pure mercury and a very little water for about two minutes, and then wash away the pyrites and examine the state of the mercury which is left behind. Nearly all will be washed away, and what is left will be in the form of a dull-looking powder or flour.

7. Now repeat the same experiment after having added to the mercury a small piece of amalgam. The mercury will be kept in the bright globular condition during the whole of the experiment, and upon washing away the pyrites, the metal will be left behind in one globule, without loss.

If the pyrites or other mineral contain gold, the amalgamated mercury will be found upon examination to have absorbed it all, whilst the common mercury will have taken up scarcely any.

In reference to this process Dr. A. W. Hofmann, F.R.S., after bearing testimony to its efficacy, says:—"The phenomena witnessed in comparative experiments, made with ordinary mercury, and with mercury to which a very small amount of sodium amalgam had been added, were truly startling. Under circumstances in which ordinary mercury rapidly lost its fluidity and globular form, the metal containing sodium retained them unimpaired; and mercury which had become entirely altered, regained its fluidity and globular character by the addition of a small amount of sodium amalgam, almost instantaneously. A gold coin which could be dipped for a few moments into ordinary mercury without being attacked in the slightest degree, was instantaneously covered with mercury when a small bit of sodium amalgam had been added to the metal. Auriferous quartz, with visible spangles of gold, exhibited exactly the same deportment. The advantages that must accrue in a commercial point of view are to my mind undoubted. Through this discovery it will now be possible to obtain a greater percentage of gold than heretofore from any given ore; and as regards the poorer auriferous ores, it will now be possible, by the elimination of these two important sources of loss, to work them also remuneratively."

Dr. Wm. Allen Miller, V.P.R.S., gives an equally favourable opinion of the process.

Dr. Frankland, F.R.S., says:—"In the processes for extracting gold and silver by amalgamation, the mercury becomes 'floured,' or 'sickened,' which causes it to be more or less carried away and lost. The mercury so washed away carries with it all the gold or silver which it has taken up. This loss Mr. Crookes prevents by the addition of an amalgam of sodium. In the native state gold and silver are always coated with a film, which prevents the contact of these metals with mercury, except after long grinding, in consequence of which large quantities of gold and silver are always being washed away in the 'tailings.' Mr. Crookes attains the necessary contact by the addition of a trifling percentage of sodium amalgam."

Dr. Odling, F.R.S., and Mr. Robert Hunt, F.R.S., also speak favourably of this process.

Some experiments which were made at the gold-bearing districts in Wales, by Mr. Readwin and Mr. Spence, tend to show that even in cases where no gold whatever was obtained by the ordinary process, the sodium process yielded upwards of 6 oz. of gold per ton.

Mr. Thomas Belt, manager of the Prince of Wales Gold and Lead Mine, Dolgelly, who has had very considerable experience in gold mining in Nova Scotia, has used the sodium process with great success in extracting gold from galena by amalgamation. The assay of the galena showed that it contained 13 dwts. 16 grains of gold per ton. Amalgamation in the ordinary way with common mercury only extracted 6 dwts. 12 grains of gold per ton, whilst when the amalgamation was conducted with the addition of a very small quantity of sodium amalgam the whole of the gold present was recovered, the yield being 13 dwts. 10 grains per ton.

A series of experiments with sodium amalgam in the treatment of auriferous ores has been conducted under the superintendence of Professor Silliman. Having at his disposal a considerable quantity of Californian gold quartz from a mine in Calaveras county, he subjected these ores to this method of amalgamation, and the results show that with unaided mercury the gold saved is less than 60 per cent. of the whole quantity of gold known to be present. In one experiments less than 40 per cent. was saved, while by the aid of the amalgam of sodium the saving is increased to 80 per cent. With regard to the mode in which the sodium acts, Professor Silliman remarks "that the action of the sodium in this case appears to be in a manner electrical, by placing the mercury in a highly electro-positive condition towards the electro-negative gold. The quantity of sodium is entirely too small to allow of the supposition that it acts by its chemical affinities. The use of the sodium amalgam for silver amalgamation must depend upon a like power of electrical action to that seen in its action on gold, and also to the well-known power of preventing the granulation (flouring) of mercury, or of saving the mercury when thus changed. Indeed, there is good reason for believing that a most important part is played by the sodium amalgam in this last particular."

The new process has been in use for some time at the gold mines at Clear Creek, Tulare Country, California, where the owners report that the quicksilver is rendered remarkably quicker and livelier for absorbing the particles of gold, by the immersion of small lumps of sodium. It has also been successfully employed in Mexico, at the Works of the Real del Monte y Pachuca Silver Mining Company (one of the largest silver mines in the world), and the St. John del Rey Gold Mining Company (Brazils) have also commenced experiments, upon which they report favourably.

RAVAGES BY INSECTS IN THE COTTON FIELDS.

The year 1866 will be memorable for the mischief done by insects in many parts of the world; the visitation of locusts in Algeria is, at present, the most terrible case recorded; but we hear from nearly all parts extraordinary accounts of the devastation caused by one kind of insect or another. In France, grasshoppers are unusually numerous and large, and some have been seen of a size that recall the locusts of hotter countries. In many places in the south the mosquitos are said to have become a perfect pest, and all over the country flies and other insects are vexatiously abundant.

Accounts from Louisiana state that the cotton crop is in danger of being eaten up by the army worm. It is impossible to form an idea of their numbers, says an observer, without witnessing the destruction which they cause. Their fecundity renders the case truly alarming; each female produces about five hundred eggs, and supposing that there is only one female insect to the acre, there will be five hundred caterpillars in six days; and, supposing half these to be females, in twenty days or so more there will be 125,000, and as the cotton plants are planted in the proportion of five thousand to the acre, there would be twenty-five insects on each plant; and these again would, in three weeks more, be increased five hundred fold.

Two years ago the planters of Louisiana, tempted by the high price of cotton, which was then selling at fifteenpence a pound, began to cultivate cotton, which had been almost abandoned. The sugar cane became of secondary importance. The soil was turned up with the avidity of gold seekers; old debts and mortgages would be all paid off with one good harvest of cotton. The terrible caterpillar has arrived, and has swept away the hopes of the planters in a few days. Fortunes that were half made have disappeared like snow before the

sun, and growers who refused to sell their growing crops have now scarcely anything left to sell. The noise made by these multitudes of voracious insects is described as audible at the distance of a mile, and to resemble the crackling of a house on fire, and the planter suffers sensations akin to those of unfortunate people whose houses are in flames.

It was thought for a long time that the army worm only visited Lower Louisiana, but this was an error; in 1788, these insects destroyed 280 tons of cotton in the Bahamas; they caused the cultivation of cotton to be given up in many of the West Indian Islands, and the case was almost the same in Egypt; in 1793, this insect visited Georgia, and in 1800 it ravaged South Carolina; four years later they descended on the whole of Louisiana; and in 1825 they ravaged the whole of the Southern States, and it was very difficult even to get seed for the following year. The last general visitation was in 1845. The army worm appears often in Guiana and other parts of South America.

The mischief done by these creatures is, fortunately, not always of the same serious extent; sometimes even the insects, when they come late, as they did last year, thin the seed pods, and produce a positive benefit. If it were not so, considering that they have appeared twenty-three times in the United States since 1793, the growing of cotton would be hazardous to be continued.

It appears, from long and careful observation, that the most favourable circumstances for the production of the army worm are heat, moisture, and clouded skies, up to the end of the month of June; when such is the case the visitation is looked upon as certain; it was so this year. The caterpillars cannot support great heat and continued drought; in Louisiana and the other states of the South, as well as in the Bahamas, a torrid summer kills them, especially where the soil is sandy. In 1826 the creatures appeared on the 1st of August in Louisiana and North Carolina, but hot weather set in, and by the 23rd of the same month they had all disappeared.

PARIS CONSERVATOIRE OF MUSIC.

The annual competition of the pupils of the Conservatoire commenced on the 12th and was concluded on the 28th of July. The following notes will show the number of competitors in each class, and also that of the prizes and honours awarded in each:—

In the class of counterpoint and fugue there were twelve candidates for honours; the awards were, a first and a second prize, and three accessits or honourable mentions.

In harmony there were thirteen candidates; no first prize was awarded, but one second prize and three accessits.

For the organ prize there seem to have been but five candidates, but the competition is said to have been brilliant; there were awarded, a first prize, a second-first prize, a second prize, and three accessits. The five laureats were all pupils of M. Benoist, who originated the organ class of the Conservatoire more than forty years ago, and has won for it a high reputation.

In the clavier class there were no less than thirty-six competitors, and the awards were, seven first, six second, and six third class medals. The theme chosen for the exercise was Hummel's "Concerto," in A minor.

The pupils in the class of Solfeggio were very numerous; the exact number is not reported; there were awarded, in the male class, eight first, seven second, and seven third class medals; in the female class, fifteen first, thirteen second, and eleven third class medals—in all sixty-one awards.

In thorough bass there were given a first, second-first, and second prizes, and a second accessit—all the prize-men being the pupils of M. Labro.

In harmony and accompaniment there were awarded, in the male class, a first and a second prize, and three accessits; and in the female class, the like awards.

All the above classes compete in private before the jury, the pupils being young, and consequently timid.

The public competitions commenced with the singing classes, and there were forty-six candidates—twenty-one in the male and twenty-five in the female class. A first and second prize and three accessits were awarded in each case. The jury was composed of M. Auber (president), MM. Ambroise Thomas, G. Kastner, Edouard Monnais, Boïeldieu, Massé, Pasdeloup, Colin, and Wekerlin.

The candidates for the prizes in tragedy were only six in number, three male and three female pupils. The first prize was awarded in the male class; the second prize was divided between two competitors; and none was given in the female class. Second and third accessits only were awarded in the male, and first and second accessits in the female class.

In comedy there were given—in the male class, a first prize, divided between two pupils, a second prize, and three accessits; and in the female class—a first prize, also divided, two second-class prizes, and three accessits.

The piano competition is always very important, and was more than usually so this year. The morceaux selected for the young men consisted of fragments of the 1st morceau of the 5th concerto of Henry Herz. There were sixteen competitors, and the prizes awarded were two first prizes, resulting from a unanimous vote of the jury, a second prize, and first and second accessits. The female class did not produce such brilliant examples as the male class, but the average was pronounced to be superior, although the competitors were exactly twice as numerous. The morceau chosen for the trial was Hummel's concerto in A flat. Three first and one second prizes, and three accessists, each of which was divided between two pupils. The laureats were all pupils of Herz, Mathias, Marmontel, Lecouppey, Lecallo, and Madame Farrenc.

In the harp class there were but two competitors, both male, and pupils of M. Prumier the elder, of whom one obtained a second prize, and the other a second accessit.

The competition in comic opera is eminently popular, and is generally well sustained. There were, on the present occasion, eight male and ten female candidates. The first prize, in the male class, was awarded to M. Devoyod, a pupil of M. Couderc, who had selected the character of *Pygmalion*, in "Galatée;" the second prize was divided between two pupils of M. Mocker, who gave the second act of "L'Eclair" and the "Nouveau Seigneur;" three accessits were awarded. The other pieces given were "Le Postillon de Longjumeau," and the "Chanteuse voilée." In the female class, Mdlle. Séveste, daughter of a former director of the Théâtre Lyrique, and pupil of M. Mocker, was unanimously awarded the first prize, for her rendering of a scene of "Fior d'Aliza," and her participation in the "Nouveau Seigneur;" the second prize was between two competitors, who played *Henriette* in "L'Eclair," and *Catarina*, in the "Diamants de la Couronne." There were also awarded a first accessit, a second accessit, divided between three pupils, and three third-class accessits; the parts being from the "Barbiere," "Domino Noir," the "Postillon," and the "Caid." The jury consisted of MM. Auber, A. Thomas, Kastner, Edouard Monnais, Cabanis, De Leuven, Bazin, Jules Cohen, and Wekerlin.

The prizes in grand opera were disputed by twenty-one candidates, of whom nine were male and twelve female. The first prize in the former class was awarded to M. Devoyod, who obtained also the first prize for comic opera; he gave a scene from "Charles VI." Two second prizes were given to pupils who rendered scenes in "Othello" and "Charles VI.;" there were also awarded a first and second accessit, the pieces being the trio from "Guillaume Tell," and the second act of the same opera. The female class did not obtain a first

prize, but three second prizes were awarded, the pieces executed being from the "Prophète" and the "Trovatore;" and a first accessit to a pupil who performed the character of *Alice* in "Robert le Diable." In all there were twenty acts or scenes performed. The jury consisted of MM. Auber, A. Thomas, Berlioz, G. Kastner, E. Monnais, E. Perrin, Carvalho, Victor Massé, and Georges Hainl.

Fine Arts.

A CASE OF COPYRIGHT.—A trial for infringement of the copyright of an engraving took place some time since in Paris, which presents some features deserving of notice. The work of art in question was a well-known picture by M. Pils, of Roger de Lisle singing the "Marseillaise" before the Maire of Strasbourg. The possessor of the copyright of the engraving of this picture cited the designer, printer, publisher, and print-seller of a lithograph, for having infringed his copyright. The painter of the original, M. Pils, was called as a witness, but declared that he was not interested on either side; he said that he saw no resemblance between the lithograph in question and his picture, although he thought the designer had approached rather too near to his composition, but neither the figures nor their attitudes were copied or imitated. The only reserve he had made in disposing of the right of engraving to the plaintiff was, that his work should not be reproduced on screens, chimney-boards, or other commercial objects. The President suggested to M. Pils that the composition had simply been reversed, but the latter thought this of little importance when the attitudes and faces were not borrowed. The Court, however, took a different view of the matter, and, while acquitting the defendants of having counterfeited the engraving of the plaintiff, decided that the latter had acted in perfect good faith in causing the seizure of the lithograph in question, and dismissed the case without costs. The matter was however taken, by appeal, to a higher court, by which the decision of the former tribunal was reversed. The Court held that there was infringement of copyright, not only when a work was servilely copied, but also when there was partial reproduction, and the borrowing of a portion of the original work; that the lithograph in question exhibited the same distribution and action of the personages in the composition; that the chief figures were the same in both productions, and were grouped in the same manner; that the attitude of Roger de Lisle, his dress, and sword, were absolutely identical; that there was servile imitation as regarded two of the figures, as well as in the back of a chair in the fore-ground, and in numerous accessories; that it was evident that the draughtsman of the lithograph had the original engraving in his eye, and, not content with drawing his inspiration from the original work, had copied it as regarded both the general form and numerous details, and had only avoided close resemblance in order that the piracy should not be too flagrant; rescinded the judgment of the lower court; ordered the defendants to pay the sum of 500 francs to the plaintiff, by way of damages, and the lithograph and stone to be given up to him, and condemned the defendant in the costs of both suits. It should be observed that the Ministerial prosecutor did not interfere in the case, so that the matter was decided on the civil action only. Had the Procureur-Imperial interfered the defendants would probably have been condemned to pay a further sum by way of fine for the infringement of the laws.

POPULAR ELECTION IN MATTERS OF ART.—The academy of Beaux Arts of Bruxelles has followed the example of the French administration in the introduction of the popular élement in connection with matters of art. The jury for the admission of works of art and the distribution of prizes at the triennial exhibition of fine arts has, for the first time, been elected by the whole body of exhibiting artists. The result, as regards the intentions of the electors, is excellent. The list of jurors is as follows:—In painting: MM. Verlat, Slingeneyer, Hallaert, Dillens, and Quinaux. In Sculpture: MM. Simonis and Jacquet. In Architecture: M. Suys; and in Engraving M. Franck; all eminent artists. An unfortunate accident occurred, however, in the section of sculpture. M. Vandenkerckhove obtained 17 votes, M. Simonis 14, and M. Jacquet 13; but a part of the balloting tickets bore the Christian name, Auguste, and the others Augustin; and the scrutineers declared that they could not be counted in favour of the same candidate. This decision seems most extraordinary, for there is but one known Belgian sculptor who signs himself Aug. Vandenkerckhove. Several artists immediately protested against the decision of the scrutineers, and M. Vandenkerckhove has since addressed a letter to the Minister of the Interior demanding a new election. This is an unfortunate *contretemps*, but in no way affects either the principle of such elections or the judgment of the artists who placed at the head of the poll the best names in Belgium. The experiment thus adds another great argument in favour of the artistic franchise.

ART IN BELGIUM.—It is proposed to decorate the Academic Hall of the free University of Brussels in a sumptuous manner; the paintings to be in *fresco*. The cost is estimated at £6,000, two-thirds to be furnished by the Government, and the remainder by the municipal authorities.—The Royal Museum of Antiquities of Brussels has acquired three collections, containing a great variety of samples of decorative papers of the 17th and 18th centuries, the production of an ancient manufactory of the country. There existed at Malines, in the 17th century, if not earlier, a manufacture of ornamental papers for covering books and other similar purposes, and, at a later period, for the decoration of apartments. The Government is taking active measures to render the technological section of the museum as complete as possible in drawings and samples illustrative of the ancient industries of the country, such as the manufacture of various kinds of Brussels, Malines, Grammont, and Ypres, and of the old stamped or impressed leather work, known as Cordova hangings.

Manufactures.

PURIFICATION OF DRINKING WATER.—Mr. Alfred Bird, of Birmingham, has just brought out a plan for purifying water taken from rivers, ponds, tanks, and wells. The principle upon which the plan is founded is the known affinity which hydrated alumina has for organic matters, in combining with them and rendering them insoluble. Mr. Bird states the action as follows:—One part of neutral ter-sulphate of aluminium in solution is added to seven thousand parts of the water to be purified. As soon as the mixture is made, a cloudy haze is seen in the water, which haze rapidly condenses into flocculi, with little lanes of clear water of the greatest brilliancy and beauty between them. As the flocculi become more dense they rapidly descend to the bottom of the water, leaving it absolutely free from all organic colouring matter, as clear as crystal, and free from taint. The time required for complete precipitation is from six to eight hours; if, therefore, the precipitant be put in over-night, the water will be ready for use in the morning; and as time for the action to take place, and not quantity of water, is the consideration, ten thousand gallons can as quickly be purified by this process as a single gallon. The chemical action is thus described:—The lime which is in solution in the water as a carbonate combines with the sulphuric acid of the ter-sulphate, and forms sulphate of lime. The liberated hydrate of alumina instantly attacks the organic matter, which it renders insoluble,

and both rapidly descend to the bottom of the water, with the nearly insoluble sulphate of lime, while the liberated carbonic acid gas which remains in the water imparts to it a sparkling freshness and beauty. As the liberation of the hydrated alumina depends on the presence of carbonate of lime in the water, and as its absence in terrestrial waters is a most rare occurrence, the applicability of this patent for the purification of terrestrial waters may be said to be universal. Mr. Bird states that, in order to test the effect of the precipitant upon very dirty water, a gallon was taken out of the Thames at half-tide, in the centre arch of London-bridge. Into this water was put twenty drops of a standard solution of the precipitant. The water was then allowed to stand eight hours, when it was found that all the filth had settled to the bottom, and the supernatant water was clear, sparkling, and pleasant to drink. To test the superior salubrity of water which had been purified with the precipitant over the same water which had not been so purified, the following experiments were tried:—Into each of three glass jars was poured half a gallon of the purified water. In the first were placed thirty leeches, in the second two splendid gold fish, and in the third a fresh-cut bunch of water-cress, without any roots attached. The experiments were tried in the summer; the glass jars stood in a good light, and it was found that the leeches remained healthy in the water after it had stood eight days; the gold fish lost none of their vigour though the water was unchanged three days, while the cut and rootless water-cress looked green, and actually sprouted new leaves on the surface of the water after it had stood seven days. The glass jars were now emptied, and half a gallon of the same water, which had not been purified, put into each, with the same leeches, gold fish, and a fresh bunch of water-cress without roots. The glass jars stood in the same position as before, and it was now observed that the leeches on the third day began to die; the gold fish looked sickly on the second day, and it was absolutely necessary to change the water in their jar on the third day to keep them alive; as to the water-cress, on the third day the leaves began to bleach; on the fourth day the stems felt slimy and began to soften; and on the fifth day the jar had an unpleasant smell, owing to the decay of the plant. To test the possibility of there being any organic life left in the purified water, a gallon was put into a glass bottle, and the bottle placed in the sunlight; beside it was placed a similar bottle of water which had been taken from a deep well. In about a month the well water showed distinct green patches of vegetable life, while the water which had been purified with the precipitant remained as clear as crystal, and without a trace of vegetable matter, at the end of six months.

PRESERVATION OF MEAT.—Professor Redwood has invented a process, which consists in the immersion of fresh meat in melted paraffin, at a temperature of 240° Fahr. (115° centrigrade), for a sufficient time to effect a concentration of the juices of the meat and the complete expulsion of air; after which the meat, in its condensed state, is covered with an external coating of paraffin, by which air is excluded and decomposition prevented. The concentration of the juices may be thus carried to any required extent. If the meat is to be kept in hot climates its weight should be reduced by evaporation to about one-half, in which state it will contain all the nutriment of twice its weight of fresh meat, the portion driven off by evaporation consisting only of water. Thus prepared it will be fully cooked (by the heat applied in the process), and it may be eaten without further preparation, but it will also be applicable for the preparation of made dishes, including stews, hashes, soups, gravies, &c. For cold climates a less amount of heating and concentration it is considered will suffice, so that the meat may retain its original juicy condition, and, when further cooked, present the appearance, and possess all the characters, of fresh unpreserved meat. The paraffin is entirely free from taste and smell, and is not subject to change from keeping. It may be removed from the surface of the meat by putting the latter into a vessel containing boiling water, when the paraffin as it melts will rise to the surface of the water, and may be taken off in a solid cake when cold, while, at the same time, the meat will become softened and prepared for cooking in any suitable way. Among the advantages of the process may be mentioned its great simplicity, the facility with which it can be performed by unskilled workmen, and its inexpensive character, as the same paraffin can be used for an indefinite number of times, and the quantity required for coating the meat is very small. When the meat is concentrated, as described for hot climates, it is rendered very portable, and no special care is required in packing it. Professor Redwood is now taking steps for having the process tested in South America on an extensive scale. A specimen of the meat preserved by this process has been deposited at the Society of Arts.

COLD BLEACHING PROCESS.—M. Tessié du Mothay and M. Rousseau describe very satisfactory trials which they have made of a cold bleaching process, by means of which all textile materials, whether silk, cotton, linen, flax, wool, or any woolly fibre, can be bleached. The agent employed is permanganate of soda, slightly acid, prepared by a new and economical process. With this salt, the extraordinary properties of which have of late years been much studied, a bath is prepared, in which the materials to be bleached are dipped. They are stirred about with a glass rod from time to time, and after about ten minutes they are taken out of the bath, strongly coloured of a violet brown hue by an abundant deposit of oxyde of manganese. They are then dipped as quickly as possible in a bath of water, acidulated with sulphurous acid, and again stirred and turned over with a glass rod, and after two or three minutes the materials or thread, originally of yellow or grey colour, are already white. These operations are repeated twice more, and the result is a brilliant white, whilst the fibres are in no way injured. The materials operated upon were cotton fabrics, dirty as they came direct from the loom, as well as skeins of linen thread of a dark slate colour, which by existing processes would have taken many days to bleach.

ROAD TRACTION-ENGINES.—The first of a number of traction-engines, required by the Ottoman Carrying Company, has recently been turned out by Messrs. Dübs and Company, locomotive works, Glasgow, from designs of Mr. D. K. Clark, C.E., embracing the Bray driving-wheel and many points of novelty. The engine is intended for service in Syria, between Damascus and the port of Beyrout, a journey of 68 miles, across mounts Libanon and Anti-Libanon, and is to carry ten tons of goods over steep inclines of 1 in 12, and others scarcely less steep, at the rate of from three to five miles per hour. This engine differs in several important particulars from the ordinary construction of traction-engines. These have for the most part been made, as a *sine quâ non*, cheap, after the model of the common portable-engine for agricultural purposes, combining the means of occasionally taking a load across a field or along a country road with the means of driving machinery. But in the new engine, which is supported on bearing springs, a strong frame is constructed expressly to carry the boiler and the whole of the machinery, and to bear all the stress and fatigue incidental to the hauling of heavy loads on common roads. By means of a compact differential motion the engine is enabled to turn the quickest curves, with a train behind it, with the greatest facility, the outer driving-wheel being, by self-acting means, enabled to revolve faster than the inner one, as in an ordinary carriage or waggon; thus the whole tractive power of the engine is available in turning the curves, getting rid of the stress and loss of power caused by the inevitable slipping and grinding of engines not so fitted. The machinery is arranged horizontally beneath the boiler, and thus a very simple and compact system of

framing has been matured. The Bray teeth, which are applied to the driving-wheels, are formed hollow, so as to receive the thrust of the teeth-rods inside, and thus avoid the tilting action of a thrust on end. By means of these and other specialities, Mr. Clark has endeavoured to combine great strength and lightness with efficiency and durability, at the same time that the cost is moderate. The engine carries 500 gallons of water and 15 cwt. of coal; and when tested with the regulation load of 10 tons, carried in two waggons, over the steep inclines of the Cathcart-road, near Glasgow, she ran at an average speed of four and a half miles per hour, going and returning, the prevailing gradient being 1 in 13½, on a macadamised surface. The maximum speed was about six miles per hour, equal to that of a London four-wheel cab. The engine has been solidly constructed, of the best material and workmanship, and has been beautifully finished, to the great credit of the young but already celebrated firm of Messrs Dübs and Co. This, the first traction-engine constructed for the Ottoman Company, is named the "Abdul Aziz."

Commerce.

ORCHID TEA.—An account of this product, quoted from the *Gardener's Chronicle* has already appeared in the *Journal*.* It is much prized by the natives of the place where it grows for its valuable properties, and is called by them Faham or Bourbon tea. No specimens of this tea have at present appeared in any of the London shops, but it seems to be pretty well known in Paris, where it can be readily procured at a reasonable rate. Messrs. Travers, in their circular, say—"We have had an opportunity of tasting it, and although we can never hope to agree with the natives of Réunion and Mauritius, who actually, it is said, prefer it to the Chinese plant, still we must own that the flavour is far from disagreeable, and under certain conditions the beverage might be rendered very palatable. Much, of course, depends upon the way in which it is infused. The tea may, in trade phraseology, be described as having an exaggerated Kaisow flavour; it has a flat, open, untwisted leaf, mixed with the stalks of the plants, and an agreeable smell, like that of new-made hay. The flavour is certainly peculiar, and from the single sample we have tasted, we should be unwilling to pronounce a decided opinion on its merits, but it is such that we can understand persons who are accustomed to it relishing it extremely. In the circulars issued by Messrs. Bousquin, Galerie Vivienne, Paris, the house which has imported Faham, its superiority to tea and coffee is said to consist in its soothing properties, in cases of cold and similar affections, and in its not causing sleeplessness—an important advantage to many. We are not in a position to say anything as to these properties, having merely tasted it with a view of ascertaining if indulgent nature had really bestowed upon mankind another substitute for the fragrant Chinese herb. With the class of teetotallers we apprehend it will meet but little favour, as, in addition to milk, the employment of alcoholic liquors, more especially of rum, is particularly recommended in order to draw out the flavour more effectually. One decided advantage it certainly has over our ordinary tea, and that is, that any quantity put aside to cool, will, when warmed up again, have all the flavour, freshness, and strength of the original decoction. It must not be forgotten, too, that it is essential to drawing out the proper qualities of this tea that it should be boiled, not made by infusion."

FRENCH IMPORTS AND EXPORTS.—A comparative statement of the French imports and exports for the first six months of the present year shows that the total amount of imports is 1,593,500,000f., being an augmentation of 312,498,000f. as compared with the corresponding six months of last year. The exports amount for the same period to 1,778,644,000f., against 1,390,520,000f. in 1865, showing an increase of 388,124,000f. in favour of the present year. The *Avenir Commercial* observes, on these returns, that M. Thiers should now be convinced, and probably is convinced, that the experiment of free-trade is more advanced than he supposed some time ago. The protectionists had always contended that whenever there was a monetary crisis in England, France would be deluged with English products to the utter ruin of the French manufacturer. The discount has since the middle of May been at 10 per cent., and France has no more been deluged with English manufactures than drained of her precious metals, in spite of the enormous difference in the rates between the two countries. The value of the exports in grain and flour has been, for the first six months of the present year, 122,252,000f., whereas, during the same period last year it was but 36,921,000f. One of the items which indicates most clearly the thriving condition of French industry is that of coals. The import of this article for the first six months in each year was:—1862, 49,001,000f.; 1863, 50,331,000f.; 1864, 55,171,000f.; 1865, 62,182,000f.; 1866, 70,392,000. The export for the same period was:—1862, 1,510,000f.; 1863, 1,742,000f.; 1864, 1,999,000f.; 1865, 1,834,000f.; 1866, 3,015,000f. The export of woollen tissues was:—1861, 83,332,000f.; 1862, 91,353,000f.; 1863, 125,195,000f.; 1864, 167,123,000; 1865, 151,335,000f.; 1866, 197,693,000f.

* Present vol. p. 448.

Colonies.

INTERCOLONIAL EXHIBITION AT MELBOURNE.—The magnitude of this undertaking has involved the erection of a very large building, so that it will be scarcely possible to be opened before the 1st October. It is to remain open for three months, till January 14, 1867, thus giving more time for the several local exhibitions already organised. The mineral treasures are to be exhibited below ground, instead of in the ordinary way, for which is to be constructed a gallery or tunnel, having ascending or descending shafts, worked as hydraulic lifts, capable of taking 12 to 15 people down at once. The tunnel to be 50 to 100 feet long, lined with various minerals, and divided into sections, showing the characteristic formation of each deposit. The shafts to be about 50 feet deep, and the tunnel to be lighted with gas and the magnesium light. By communications received from the Tasmanian Commissioners satisfactory preparations appear to be being made in that colony. The Commission, numbering sixteen of the leading names in the island, have had a grant of £500 placed at their disposal by the Tasmanian Government, for the carrying out of the objects of the undertaking. New South Wales does not appear to have taken any official steps, although, amongst individuals, some stir is becoming perceptible. Exception, however, must be made in favour of the districts of Clarence and Richmond, the northern portion of New South Wales, which proposed to hold a preliminary exhibition at their head-quarters, Grafton, at the end of May. The vocabularies and accompanying explanatory and suggestive address by the President, have now been widely circulated amongst those considered to be the most competent recipients, and favourable answers have been received from some of the gentlemen thus addressed, cordially endorsing the views of the President, and promising their valuable aid in the work; and in one district, that of Corandêrik, a number of the aborigines have notified an intention of becoming competing exhibitors in the articles of opossum skins, rugs, baskets, &c. The principal object of the exhibition appears to be to bring together the principal articles intended to be sent to the Paris Exhibition next year.

Endeavours are making to get the several colonies to unite and form a great Australian department at Paris. South Australia has already consented to this, and it is expected the other colonies will also agree to combined action. At Brisbane the local exhibition of the products, &c., of Queensland, which were to be forwarded to the Intercolonial Exhibition at Melbourne, and thence to Paris, was opened on the 15th May. The display was small, but more exhibits were expected. Cotton, woods, marbles, and silks, were the prominent articles. Mrs. Timbrill showed thirteen boxes of raw silk. This lady received a prize from the Victoria Board of Agriculture in 1862, and a medal at the Dublin Exhibition in 1865, and the silk specimens then shown are now in the South Kensington Museum. In Western Australia Governor Hampton had nominated a commission to insure a due representation of the natural products of the colony, fully appreciating the importance of a design so well calculated to unfold the resources of the several parts of Australia. In Tasmania the sum of £500 has been voted by the Government for the Melbourne show. Among the articles to be exhibited are iron ore, coal, marble, building stones, gold, copper, slate, wool, grain, timber, boat-building, casks, saddlery, pipe-clay, wines, vinegar, cider, preserves, aboriginal weapons, photographs, colonial grown silk, the wild flowers of the colony in wax, and the fruits in plaster. In Victoria £2,000 has been voted by the Parliament for the Paris Exhibition, and Sir Redmond Barry appointed special executive commissioner. The quantity of grain agreed to be shown in Melbourne and at Paris is to be one bushel. It is also arranged that the ordinary length of specimens of timber is to be four feet, but as some of the woods are particularly fine, they will be shown on a larger scale. Large collections of plaster models of fruit, coloured from nature, will be shown by all the principal colonies, and collections of photographs, embracing the leading subjects in architecture, local scenery, &c. In Natal an influential committee has been formed, and the following articles are intended to be sent. Map of the colony, meteorological tables, photographs and drawings, furniture, &c., made of various kinds of wood, colonial and native pottery, leather work, basket work, &c. Silk, woollen, and cotton fabrics, coloured wools; marble, coal, iron ore, pottery clay, copper ore, plumbago, &c.; wood in slabs; resins and gums; bird skins, animal skins, horns, vegetable wax, cotton, flax, wool in grease, cocoons, tobacco and Kafir snuff, castor oil seed, ground nuts, medicinal barks and roots, &c.; felloes, yokes, spokes, axles, waggon chests, &c., harness made of colonial leather; lime made of marble, slate; wheat, flour, barley, rice, maize, maize flour; preserved fruits, fruit and vegetable seeds; colonial rum, brandy, wines and beer, and other colonial products of interest or commercial value, which are to be dispatched not later than the beginning of November.

FARMING IN NEW SOUTH WALES.—Among the witnesses examined before a select committee appointed by the colonial Parliament to inquire into the state of the colony, only one was a practical agriculturist, but as he has farmed continuously for 20 years, and through many colonial vicissitudes, his evidence has considerable value. Mr. J. U. Oxley has farmed 1,000 acres of land in the county of Cumberland; his experience is that he has found the pursuit moderately profitable, and, on the whole, has made a living out of it, but he has found his mill more profitable than his farm. His farming was more profitable before the discovery of gold than it has ever been since. The wages of labour enter so largely into the cost of production, that the rise therein has been a greater obstacle to profit than bad seasons. In one year he obtained from the ground an average crop of 25 bushels to the acre from 250 acres, and the price of wheat ranged from 4s. to 7s. per bushel, but the sale yielded him no profit. Before the discovery of gold farm labourers could be had for 2s. 6d. and 3s. per day, now they cost 4s. 6d. per day. This makes it difficult for those who have to depend on hired labour to farm at a profit. The tendency of such a state of things is of course to throw the farming into the hands of those who farm small plots, and find the labour within their own families. This, according to Mr. Oxley, is especially the case with maize, which requires a great deal of labour. The only remedy he sees is high farming, and he thinks it will pay to farm a smaller area, and to farm it better. He admits that colonial farming, as a rule, is very slovenly, and that he himself is very much behind the English agriculturists. Irrigation and drainage, Mr. Oxley thinks, would both pay, but they of course require a large investment of capital. Not much of the land in the county of Cumberland is appropriated to the fattening of store stock, whether from want of enterprise, or because it will not pay, is not clear. Fat stock, sent down the Hunter, realize prices that might seem to make it profitable to fatten stock nearer the metropolis.

THE WHEAT CROP IN SOUTH AUSTRALIA has been very poor in some places, having yielded only 8¾ bushels per acre. Last year it yielded 11 bushels, and was considered very poor. A large quantity of land which was sown for wheat was cut down for hay. The high price of hay towards the close of last year induced many farmers to cut down their young wheat. Taking the whole of the districts it appears that the returns give 3,587,246 bushels as the yield for the harvest, as compared with 4,252,949 bushels, the yield of the former one. Of course, as population has increased, a greater quantity will be required for home consumption and for seed. 160,000 people, at six bushels per head, which is considered a fair estimate for home consumption, will require 960,000 bushels. Then the seed-wheat, at a bushel and a-half per acre, for 450,000 acres, which is not too high an estimate, will take 675,000 bushels more, making a total for home requirements of 1,635,000 bushels. Reckoning 45 bushels to a ton of wheat-flour, there will be about 434,000 tons for export this year.

THE QUEENSLAND LOAN of 1864, amounting to £1,019,000, is to be applied as follows:—Immigration, £100,000; railways, £847,000; telegraphs, £10,000; public works, £47,000; advances to corporations £15,000.

Publications Issued.

FIRE PREVENTION AND FIRE EXTINCTION. By James Braidwood, first superintendent of the London Fire Brigade, and Associate of the Institution of Civil Engineers. (*Bell and Daldy.*) This work comprises Mr. Braidwood's experience of nearly forty years as head of the London and Edinburgh Fire Brigades, and treats of fire-proof structures, fire-proof safes, public fire brigades, private means for suppressing fires, fire engines, fire annihilators, portable fire escapes, water supply, &c. The editor in his preface says:—"The appearance, at the beginning of last year, in the annual report of the Institution of Civil Engineers for 1861 and 1862, of a short memoir of Mr. Braidwood, suggested the publication of a more extended account of the life of the late head of the London Fire Brigade, combined with his opinions upon the subject of his profession. These opinions are comprised in a work on "Fire Engines, and the Training of Firemen," published in Edinburgh in 1830; two papers upon cognate subjects, read before the Institution of Civil Engineers, two similar papers read before the Society of Arts, and in a variety of reports upon public buildings, warehouses, &c. While regretting the great loss that the public has sustained, in being deprived by Mr. Braidwood's sudden death of a complete record of his long and varied London experience, it has been considered advisable to republish the above materials arranged in a systematic form, omitting only such parts as the author's more matured experience

rendered desirable, but confining the whole to his own words." There is an appendix on steam fire engines and the Metropolitan Fire Brigade, which brings the information on these subjects up to the present date.

A PRIZE ESSAY ON THE DETACHED LEVER ESCAPEMENT, by Moritz Grossman, which received an award of thirty guineas from the British Horological Institute, has been published in the *Horological Journal* (*Kent and Co.*, Paternoster-row), for June, July, and August; and a book containing twenty-six lithographic diagrams, with various tables of proportions, by the same author, illustrative of the Essay, has been issued.

ON THE APPLICATION OF DISINFECTANTS IN ARRESTING THE SPREAD OF THE CATTLE PLAGUE. By William Crookes, F.R.S. (*J. H. Dutton.*)—This is taken from the "Appendix to the Third Report of the Cattle Plague Commission," and is a reprint of the elaborate report made by Mr. Crookes, who was employed by the Commission to investigate the action of certain disinfectants in reference to the cattle plague poison. The Commissioners say—"Disinfection, in the sense in which the word is used here, implies the destruction of an animal poison, in whatever way it is accomplished. To find a perfect disinfectant for the cattle plague poison would be to stop the disease at once. We have naturally been very desirous of discovering a substance with such a power; but much more evidence is necessary before we can venture to affirm that success has been obtained. In the first instance we requested Dr. Angus Smith to undertake this subject, with a view of seeing what chemical agent would be best suited for the purpose. Subsequently, at his suggestion, Mr. Crookes was asked to carry on various practical trials, which might test the efficacy of two agents which Dr. Angus Smith had reported to us as likely to be useful. * * * On examining different agents it is soon found that the number of those which can be employed with advantage is limited. Since the poison is constantly given off in discharges flowing from diseased surfaces, and since it may be suspended like impalpable dust in the air, it becomes necessary that any disinfectant should act continuously both on the discharges and on the air. No disinfectant can be efficacious if its action is intermittent, or if it does not act on both sources of danger. It is evident, indeed, that the poison ought to be destroyed at the very moment of evolution or discharge. Every minute during which it remains active increases the danger. The disinfectant must, therefore, not only be both fixed and volatile, but so cheap and easily used as to be continually in action, and it must of course be innocuous to cattle and men. A large number of substances which can be used in many other cases as disinfectants must be put aside, as not meeting these necessary conditions. Compounds of iron, zinc, lead, manganese, arsenic, sodium, lime, or charcoal powder, and many other substances, want the volatile disinfecting power; iodine, bromine, nitrous acid, and some other bodies are too dear, or are entirely volatile, or are injurious to the cattle. On full consideration, it appears that the choice must lie between chlorine, ozone, sulphur, and the tar acids (carbolic and cresylic). Two of these bodies, viz., chlorine, in the shape of chloride of lime, and the tar acids, have the great advantage of being both liquid and aëriform; they can be at once added to discharges, and constantly diffused in the air. All these four substances—chlorine, ozone, sulphur, and the tar acids—have been practically tested, either in England or on the Continent, and there is considerable evidence that they all actually do destroy the cattle plague poison. Their precise mode of action is still uncertain. Chlorine and ozone act, no doubt, as powerful oxidisers, converting animal poisons into simple and innocuous substances. Sulphurous acid probably destroys the virus by its strong antiseptic powers. The tar acids, according to the experiments of Mr. Crookes, neither interrupt nor accelerate oxidation, but they act most powerfully in arresting all kinds of fermentative and putrefactive changes, and annihilate with the greatest certainty all the lower forms of life. After a full consideration of the relative merits of the four disinfectants, and after some practical trials, Mr. Crookes arrived at the conclusion that the most powerful, and at the same time most simple, process of disinfection would be to use the tar acids as constant liquid and aëriform disinfectants, and sulphur in the form of sulphurous acid as an additional and occasional agency. * * * The general result of experiments on disinfection with carbolic acid and sulphur is certainly very encouraging. For the reasons stated in Mr. Crookes's report, it appears that chloride of lime is inferior to the combined use of carbolic and sulphuric acids. But there is no doubt of the efficacy of this agent, and in certain circumstances, as for the washing of railway trucks, it may be employed in addition to boiling water or steam. It is very desirable that the use of carbolic acid should become general throughout the country in uninfected as well as in infected districts. There is little doubt that even were there no danger from cattle plague, the great purifying effect of this substance on the air of cattle sheds would contribute greatly to the health of the animals."

Notes.

LABOURERS' DWELLINGS.—A copy of rules and regulations with reference to loans to be made towards the erection of dwellings for the labouring classes under the 29th Vic., c 28, has just been issued from the Parliamentary Paper-office. Mr. M'Cullagh Torrens has given notice next session to move for leave to bring in a bill to provide better dwellings for artisans and labourers.

PNEUMATIC DESPATCH COMPANY.—The report of the directors of this company states that previous to the meeting in January last, the directors reported that the delay in the carrying out of the Holborn viaduct would render it necessary for the tube to be carried under the existing streets and over the Fleet sewers, which it was hoped would have been avoided by the construction of the viaduct; and pending the consideration and final settlement of these points, the directors had determined to test the cost and facility of working by a series of carefully recorded experiments which were then in progress. Those experiments having now been fully carried out, the directors are perfectly satisfied with the results, from which it appears that 120 tons of goods can be passed through the tube per hour, at the rate of eighteen miles an hour, at the cost of under 1d. a ton per mile. The directors have also ascertained from statistical information furnished them by the directors of the London and North-Western Railway Company, that the line of tube, when completed, will return a large per centage on the capital expended on its construction. After such satisfactory results, the directors made overtures to the London and North-Western Railway Company to assist them in completing the line, which overtures were most favourably received.

THE ATLANTIC CABLE.—At a recent meeting of the Academy of Sciences at Paris, a conversation took place on the subject of the Atlantic cable, when M. Babinet, after expressing great doubt as to whether the cable would be lasting, said we ought at least to make it available for a useful purpose. He recommended that we should profit, and that at once, by the electric cable which unites the New World and Valentia, to determine the exact longitude of the American station.

METROPOLITAN RAILWAY IMPROVEMENT.—The new omnibuses of the Metropolitan Railway Company have commenced running from the Portland-road station to Regent-circus, for the convenience of travellers on the railway. Passengers can book through from any station on the Metropolitain line to Regent-circus, and *vice versa*.

The omnibuses are intended to carry 40 passengers, 23 outside and 17 inside. The interior is divided transversely into two compartments. The back compartment is entered in the usual way at the end of the omnibus, and appropriated to the reception of second and third-class passengers. The front compartment is fitted up for the accommodation of first-class passengers. There are places for umbrellas, and bell-pulls in each compartment for stopping. The first-class compartment is entered by doors placed on each side of the carriage between the fore and hind wheels, so that passengers can step off the footway into it without going into the roadway. There are two flights of steps and brass rails at the end of the omnibus to ascend to the seats on the roof for sixteen second and third class passengers. There is also a seat across the top, immediately behind the driver, and also on each side of him, for seven first-class passengers. The omnibus is drawn by three horses.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb.

Delivered on 26th July, 1866.

241. Bill—Public Libraries Act Amendment (amended in Committee, and on Re-commitment).
419. Cattle Plague—Nine Orders in Council.
423. St. James, Clerkenwell—Correspondence.
428. East India Communications—Report.
437. Lambeth Workhouse—Correspondence.
436. Civil Services—Supplementary Estimate.
East India (Railways)—Report by J. Danvers, Esquire.

Delivered on 27th July, 1866.

240. Bills—Common Law Court (Fees and Salaries).
242. ,, New South Wales and Van Diemen's Land Government.
243. ,, Oysters Cultivation (Ireland).
244. ,, Fortifications (Provision for Expenses).
380. Jamaica—Letter, &c.
404. Post Office—Comparative Statement.
435. Enfield Rifles—Report.
Enfield Rifle (Snider's Method)—Further Reports.

Delivered on 28th July, 1866.

245. Bills—Naval Discipline amended).
247. ,, Extradition Treaties Act Amendment.
248. ,, Law of Capital Punishment Amendment.
400. Public Income and Expenditure (1866—Account.
427. Trade in Animals—Report from Select Committee.

Delivered on 30th July, 1866.

224. Bills—Constabulary Force (Ireland).
246. ,, Dockyard Extensions.
249. ,, Pensions (Lords Amendment).
250. ,, Prisons.
251. ,, Cattle Diseases Prevention Act Amendment (No. 2).
252. ,, Ecclesiastical Commission.
418. Tramways (Ireland) Acts Amendment Bill—Report, Evidence, &c.
443. Cattle Plague—Two Orders in Council.

Delivered on 31st July, 1866.

68 (VI). Trade and Navigation Accounts (30th June, 1866).
125. Small Tenements—Return.
336. Terminable Annuities—Return.
349. Superior Courts of Law—Return.
401. Coinage—Account.
444. Oxford University—Two Statutes.
379. Edinburgh Annuity Tax Abolition Act (1863)—Report.
Extradition Treaty (France)—Correspondence.

Delivered on 1st August, 1866.

253. Bills—Public Health (as amended by the Select Committee, and on Re-commitment).
255. ,, Expiring Laws Continuance.
412. Civil Contingencies Fund—Accounts.
438. Distillers, &c.—Return.
448. Expiring Laws—Report of Committee.
Colonial and other Possession—Statistical Abstract for 1851 to 1864 (Number 2).

Delivered on 3rd August, 1866.

270 (I). London (City) Corporation Gas, &c., Bills—Index to Report.
447. Piers and Harbours (Ireland)—Case.
453. Houseless Poor (Metropolis)—Return.
Public General Acts—Caps. 53 to 57.

Delivered on 4th August, 1866.

327. County Treasurers—Abstract of Accounts.
460. Saint Stephen's Green (Dublin) Bills (1864, 1865, and 1866)—Return.
465. Railways (Guards' and Passengers' Communication) Bill—Special Report.
466. Eastern Mails—Report from Captain Tyler, R.E.

Delivered on 6th August, 1866.

259. Bills—Indemnity.
260. ,, Railway Companies' Securities—Lords Amendments.
371. Gas Companies (Metropolis)—Accounts.
445. North American Mails—Correspondence.
446. Registry of Deeds (Ireland)—Memorials.
456. National Education (Ireland)—Correspondence.
461. Orange Meeting (Ballykilbeg)—Correspondence.
469. Workhouses (Metropolis)—Circular.

Patents.

From Commissioners of Patents' Journal, August 3rd.

GRANTS OF PROVISIONAL PROTECTION.

Acids, obtaining—1885—R. Irvine and P. Brash.
Anchors—1536—C. T. Julius.
Cast iron, refining—1933—J. Livesey.
Enamelled paper, polishing—1921—W. E. Newton.
Envelopes, fastening for—1879—D. M. Gilbert and L. A. Dubreux.
Envelopes, gumming and printing—1556—W. E. Newton.
Fibrous materials, steeping, &c.—1881—W. Tongue.
Fire arms, removing exploded cartridges from breech-loading—1061—H. A. Bonneville.
Furnaces, combustion of fuel in—1658—J. Abbot.
Furnaces, consuming smoke in—1901—R. Newton.
Gasaliers—1889—F. J. Rowley.
Lamps—1907—A. Magnin.
Leather for boot fronts, crimping—1821—A. V. Newton.
Liquids, imbibing—1895—W. Bellamy.
Machine wires—1772—W. McAllum.
Materials, uniting—1762—T. Cook.
Metal cartridges 1656—J. G. Tongue.
Metallic structures—1891—H. Smith.
Metals, shaping—1903—R. Mitchell.
Motive power engines—1927—H. Prince.
Motive power, obtaining—1909—J. Ramsbottom.
Motive power wheels—1899—A. B. B. V. Rathen and G. H. Ellis.
Ordnance, receiving the recoil of—1935—J. Vavasseur.
Paraffine wax, refining—1905—J. Leach.
Piano and music stool, a convertible—1806—J. Millward.
Pianofortes—1883—A. N. Wornum.
Railway carriages—1923—W. E. Kochs.
Ships of war—1925—F. Palmer.
Steam, producing—1913—G. T. Bousfield.
Surfaces, coating—1815—A. V. Newton.
Tanning 1915—G. Mountford and C. L. Loversidge.
Weaving—1929—J. Boeddinghaus.
Weaving, looms for—1931—H. Lea and T. Lane.
Woods, dyeing—1937—W. E. Newton.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

Firearms—1932—H. Calisher.
Fuel—1971—G. T. Bousfield.

PATENTS SEALED.

362. E. A. H. Beuther.
365. T. J. Smith.
368. R. Sims, J. Beard, & R. Burns.
372. W. Richards.
376. J. A. Maxwell.
377. A. Clark.
381. J. Sawyer and S. Middleton.
386. J. Townsend.
491. W. S. Riley.
606. W. E. Newton.
616. W. E. Newton.
784. E. Tonks.
815. H. B. Barlow.
1532. A. V. Newton.

From Commissioners of Patents' Journal, August 7th.

PATENTS SEALED.

402. R. W. Armstrong.
403. F. T. Baker.
404. J. Rock, jun.
410. T. Clift.
412. C. E. Giajola.
414. V. T. Junod.
416. J. J. Shedlock.
417. J. and W. Binns.
418. J. Ryley.
423. J. Pinches.
424. J. and H. Charlton.
429. G. W. Cumming and J. K. Edmonds.
450. T. Whitley.
471. J. and J. K. Soames.
472. R. Napier.
484. P. Ward.
499. J. H. Whitehead.
501. J. H. Whitehead.
525. J. Barry.
549. H. Bright.
571. R. Leake and J. Beckett.
587. J. Pickin and R. Bailey.
697. H. Chandler.
765. W. Clark.
878. R. Newton.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

1901. W. Cotton.
1913. J. W. P. Field.
1924. E. A. Cotelle.
1914. B. W. Gerland.
1987. R. Mushet.
1941. J. Young.
1959. J. Thompson, and E. G. and F. A. Fitton.
1981. J. G. Willans.
1982. W. Clark.
2061. G. T. Bousfield.
2245. M. Gerstenhofer.
1939. W. P. Hodgson and J. V. Woodifield.
1954. R. A. Brooman.
1958. E. Morewood.

PATENT ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

2018. G. Parsons.